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# MARINE CORPS DINING CONCEPTS IN THE 1990'S VOLUME III: THE SYSTEMS ANALYSIS

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To regain efficiency and excellence in its feeding facilities, the U.S. Marine Corps needs to renovate or build new mess halls with a long-term (15 to 20 years) plan in mind.

This report, Volume III of a four volume set, is the systems analysis, detailing how man and machine support the food service effort. Volume I, the executive summary, establishes the analysis, synopsizes the conclusions, and provides the overall recommendations. Volume II provides analysis of demographic factors, food industry trends, and expert opinions that may influence future food service. Volume IV provides the physical layouts, decor recommendations, and equipment lists for suggested dining facility configurations.

These volumes culminate the investigations of numerous people over the course of the project and are offered as templates for future Marine Corps dining facilities.


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# MARINE CORPS DINING CONCEPTS IN THE 1990'S VOLUME III: THE SYSTEMS ANALYSIS

## SURVEY AND SYSTEMS OVERVIEW

### Introduction

During FY87, 166 food service industry practitioners participated in an extensive survey designed to determine which food service system they felt was best suited for the future. Respondents were from a variety of food service segments, including commercial independent full service, commercial independent fast service, commercial chain full service, commercial chain fast service, institutional feeders (government facilities, college feeding, employee feeding, and school systems), contract feeders, military feeders, independent lodging food service feeders, and chain lodging food service feeders (see Table 1 below for a breakdown of the participants in the survey).

TABLE 1. Survey Participants.

| PARTICIPANTS | RESPONSE | PERCENTAGE |
|---|---|---|
| Commercial Independent Full Service | 38 | 20.7 |
| Commercial Independent Fast Service | 8 | 4.3 |
| Commercial Chain Full Service | 13 | 7.0 |
| Commercial Chain Fast Service | 22 | 12.0 |
| Institutional Government Facility | 5 | 2.7 |
| Institutional College Feeding | 18 | 9.8 |
| Institutional Employee Feeding | 44 | 23.9 |
| Institutional School System | 5 | 2.7 |
| Contract Feeding | 19 | 10.3 |
| Military Feeding | 2 | 1.0 |
| Lodging Food Service Independent | 3 | 1.6 |
| Lodging Food Service Chain | 7 | 3.8 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

In an effort to ensure that the responses accurately reflected the national trend in food service rather than any regional trends, the survey participants were evenly drawn from each geographic region of the United States (see Table 2).

TABLE 2. Geographic Distribution of Respondents.

| GEOGRAPHIC LOCATION | RESPONSE | PERCENTAGE |
|---|---|---|
| New England (ME, NH, VT, MA, CT, RI) | 39 | 14.2 |
| Middle Atlantic (NY, NJ, PA) | 56 | 20.4 |
| North Central (OH, IN, IL, MI, WN, MO, ND, SD, NE) | 40 | 14.6 |
| South Atlantic (DE, MD, VA, WV, NC, SC, GA, FL) | 41 | 14.9 |
| South Central (KY, TN, AL, MS, AR, LA, OK, TX) | 33 | 12.0 |
| Mountain (ID, WY, CO, NM, AZ, UT, NV) | 28 | 10.2 |
| Pacific (WA, OR, CA, AK, HI) | 38 | 13.8 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

The purpose of the survey was to solicit information from a wide range of respondents currently engaged in the food service industry. Considerable effort was made to survey those industry participants who held operations management positions in their organizations. Tables 3, 4, and 5 indicate that the survey was successful in tapping the knowledge of the intended group.

TABLE 3. Level of Management of Respondent.

| LEVEL | RESPONSE | PERCENTAGE |
|---|---|---|
| Corporate Officer | 87 | 32.5 |
| Regional Manager | 15 | 5.6 |
| Area Manager | 114 | 42.5 |
| Unit Manager | 24 | 9.0 |
| Unit Assistant Manager | 3 | 1.1 |
| Department Manager | 21 | 7.8 |
| Supervisor | 4 | 1.5 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

The respondents managed businesses of various sizes. As Table 6 indicates, a majority of the respondents managed businesses served 200 to 5000 meals per day. Over 11% of the respondents managed large food service operations that served over 10,000 meals per day.

TABLE 4. Area of Management Responsibility of Respondent.

| AREA | RESPONSE | PERCENTAGE |
|---|---|---|
| General Food Service Manager | 103 | 53.6 |
| Sales/Marketing | 19 | 9.9 |
| Accounting/Finance | 21 | 10.9 |
| Production Management | 8 | 4.2 |
| Service Management | 16 | 8.3 |
| Distribution Management | 6 | 3.1 |
| Personnel Management | 10 | 5.2 |
| Military (Officer) | 1 | 0.5 |
| Military (Enlisted) | 8 | 4.2 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

TABLE 5. Area of Past Responsibility.

| AREA | RESPONSE | PERCENTAGE |
|---|---|---|
| General Food Service Management | 114 | 56.7 |
| Sales/Marketing | 21 | 10.5 |
| Accounting/Finance | 17 | 8.5 |
| Production Management | 14 | 6.7 |
| Service Management | 13 | 6.5 |
| Distribution Management | 9 | 4.5 |
| Personnel Management | 13 | 6.7 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

TABLE 6. Average Number of Meals Served Per Day.

| MEALS | RESPONSE | PERCENTAGE |
|---|---|---|
| Under 200 | 17 | 10.2 |
| 201-600 | 41 | 24.7 |
| 601-1000 | 23 | 13.9 |
| 1001-5000 | 51 | 30.7 |
| 5000-10000 | 15 | 9.0 |
| Over 10000 | 19 | 11.5 |

## Food Service Systems

The type of food service system utilized by the respondents varied (see Table 7). Over one-third of the randomly selected participants in our survey used the scramble or hollow square cafeteria system in their food service operations. This percentage of respondents mirrors the growth the hollow square system has enjoyed in recent years.

TABLE 7. Type of Food Service Systems Used.

| SYSTEM | RESPONSE | PERCENTAGE |
|---|---|---|
| Full Table Service | 63 | 26.8 |
| Fast Service-Counter | 23 | 9.8 |
| Fast Service-Table | 13 | 5.5 |
| Cafeteria Straight Line | 37 | 15.8 |
| Cafeteria Hollow Square | 56 | 23.8 |
| Self Service | 9 | 3.8 |
| Take Out/Delivery | 19 | 8.1 |
| Vending | 15 | 6.4 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

The main advantage of the hollow square system is that it eliminates the need for each patron to file past all menu items. Each person can move quickly to selections of interest to them without waiting in line for items of peripheral interest. The major disadvantage is that new patrons may experience confusion learning how to use the system. Many food service operators reported that because patrons are unfamiliar with the system and/or the selections offered at each station, lines can develop in newly opened operations or in operations in which the turnover of dining patrons is frequent.

The confusion of new patrons can be overcome by adequate communication between the operation and the customers. Industry practitioners reported that well-placed signs can alleviate some of the confusion surrounding this aspect of the operation. Confusion may also be alleviated through the use of computer displays for advising and for preselection of food items. These communication methods are not currently widespread.

Most food service operators rely on the same methods of communication with patrons that have been used for years: direct contact with staff, direct contact with management, food displays, posters/pictures and cards. Table 8 illustrates how often the survey respondents used these various communication methods.

**TABLE 8. Method of Communication With Customers.**

| METHOD | RESPONSE | PERCENTAGE |
|---|---|---|
| Exit Interviews | 36 | 8.0 |
| Direct Contact With Management | 121 | 27.0 |
| Direct Contact With Staff | 115 | 25.6 |
| Focus Group Surveys | 36 | 8.0 |
| Customer Comment Cards | 93 | 20.7 |
| Direct Mail | 16 | 3.6 |
| Telephone Surveys | 13 | 2.9 |
| Other (Fill in the Blank) | 19 | 4.2 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

According to our survey, audio visual and computer-controlled communications have not made significant inroads into the food service industry. Many food service operators do not envision or appear to want such communication channels.

Most food service operators were aware that significant strides have been made in recent years in the field of food service robotics. However, when asked what types of robotics could best be applied to their operations, few operators appeared to indicate a significant interest in communication robotics (see Table 9).

**TABLE 9. Food Service Operator's Interest in Robotics.**

| OPERATOR | RESPONSE | PERCENTAGE |
|---|---|---|
| Food Preparation | 40 | 15.4 |
| Food Production | 38 | 14.7 |
| Food Delivery (Service) | 26 | 10.0 |
| Sanitation | 26 | 10.0 |
| Cashiering | 30 | 11.6 |
| Customer Ordering | 15 | 5.8 |
| Inventory Control | 67 | 25.9 |
| Other (Fill in Blank) | 17 | 6.6 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

This lack of interest in robotics for direct customer communication should not be taken as the sole determinant regarding whether or not robotics has a place in food service communications. The responses given by food service operators may indicate a lack of knowledge about the benefits of robotic communication with customers. This assumption is buttressed by the responses given by industry practitioners regarding which areas of food service operations they have noted the most significant technological advances in the past 3 years (see Table 10).

**TABLE 10. Awareness of Technological Advances in Food Service.**

| AREA | RESPONSE | PERCENTAGE |
|---|---|---|
| Cashiering | 103 | 21.7 |
| Food Production | 63 | 13.3 |
| Ordering by Customer | 13 | 2.7 |
| Ordering by Staff | 30 | 6.3 |
| Inventory Control | 92 | 19.4 |
| Behavior/Attitude Training | 35 | 7.4 |
| Sanitation/Dish/Cleanup | 41 | 8.7 |
| Delivery to Customer | 12 | 2.5 |
| Receiving | 14 | 3.0 |
| Marketing | 31 | 6.5 |
| Merchandising | 31 | 6.5 |
| Other (Fill in Blank) | 9 | 1.9 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

As Table 10 indicates, the food service operators surveyed do not recognize ordering by customers, delivery to customers, merchandising, or marketing as areas of significant improvements in technology in the past 3 years. Perhaps this is because of the lag of time between technological development and when such technology reaches the market. There are significant new methods of communications with customers that practitioners either have not recognized or have failed to embrace. Examples of this technology are computer graphic food displays, touch-screen menu displays/ordering, and various forms of audio/visual communications. While a system designed for the current year may not require these accoutrements, the USMC challenge is to design for the future. Careful consideration is given to these and other technological improvements, either for use today or in the next few years.

## Production

Where production trends are headed is covered in depth in the section that reviews the literature. Consequently, we felt that there were only three major

questions left open to the survey of industry practitioners. Those three questions were as follows: (1) Which methods of production are likely to increase in the future? (2) Which food products are likely to increase or decline in use in the future? and (3) How acceptable is the introduction of robotics to production? Industry practitioners more readily accept robotics in production than service delivery.

As shown in Table 11, methods of cooking that result in higher cholesterol consumption are fading rapidly from consumer favor (for example, estimated decrease in frying 74.1% and sauteing 44.6%). Methods that produce items viewed as good for cardiovascular control and the reduction of carcinogens are increasing (broiling 74.1%, steaming 73.5%, etc.). The same is true for food products projected for heavier future consumption (Table 12).

**TABLE 11. Anticipated Increases/Decreases in Cooking Methods.**

| METHOD | DECREASE | | INCREASE | | NO CHANGE | |
|---|---|---|---|---|---|---|
| | # | % | # | % | # | % |
| Broiling | 20 | 12.0 | 123 | 74.1 | 23 | 13.9 |
| Roasting | 35 | 21.1 | 104 | 62.7 | 27 | 16.3 |
| Deep Frying | 123 | 74.1 | 28 | 16.9 | 15 | 9.0 |
| Sauteing | 74 | 44.6 | 62 | 37.3 | 30 | 18.1 |
| Steaming | 25 | 15.1 | 122 | 73.5 | 19 | 11.5 |
| Stir Frying | 45 | 27.1 | 96 | 57.8 | 25 | 15.1 |
| Microwaving | 54 | 32.5 | 83 | 50.0 | 29 | 17.5 |
| In-House Butcher | 108 | 65.1 | 31 | 18.7 | 27 | 16.3 |
| In-House Baker | 55 | 33.1 | 90 | 54.2 | 21 | 12.7 |
| Automated/Computerized Equipment | 14 | 8.4 | 130 | 78.3 | 22 | 13.3 |

**TABLE 12. Anticipated Increased/Decreased Use of Food Products.**

| ITEM | DECREASE | | INCREASE | | NO CHANGE | |
|---|---|---|---|---|---|---|
| | # | % | # | % | # | % |
| Fresh Fruits | 7 | 4.2 | 154 | 92.8 | 5 | 3.0 |
| Canned Fruits | 120 | 72.3 | 30 | 18.1 | 16 | 9.6 |
| Fresh Meats | 36 | 21.7 | 115 | 69.3 | 15 | 9.0 |
| Preportioned Meats | 44 | 26.5 | 104 | 62.7 | 18 | 10.8 |
| Precooked Meats | 98 | 59.0 | 50 | 30.1 | 18 | 10.8 |
| Cured Meats | 118 | 71.1 | 28 | 16.9 | 20 | 12.1 |
| Fresh Baked Goods | 16 | 9.6 | 137 | 82.5 | 13 | 7.8 |
| Fresh Vegetables | 6 | 3.6 | 152 | 91.6 | 8 | 4.8 |
| Canned Vegetables | 131 | 78.9 | 18 | 10.8 | 17 | 10.2 |
| Frozen Vegetables | 50 | 30.1 | 94 | 56.0 | 22 | 13.3 |
| Fresh Seafood | 23 | 13.9 | 129 | 77.7 | 14 | 8.4 |
| Frozen Seafood | 61 | 36.8 | 84 | 50.6 | 21 | 12.7 |
| Microwavable Products | 63 | 38.0 | 83 | 50.0 | 20 | 12.0 |
| Convenience Foods | 68 | 41.0 | 70 | 42.2 | 28 | 16.9 |

Fresh meats, fresh vegetables, and fresh fruits are replacing cured meats, canned fruits, and canned vegetables. Customers have indicated a preference for these products over preserved products. Most experts relate this trend to the introduction of government health-risk statistics in the mid-1970s. As the public becomes more educated about risks associated with various food products, the emphasis on serving healthful foods will grow. This does not mean that technology associated with food production/packing will decline in importance. New improved methods of preparation and production (flash freeze, chill-heat etc.) have been pioneered in recent years and more new methods are expected in the future.

The importance of the types of cooking and food product usage relate directly to the design of a Marine facility. Equipment used in the facility should parallel expected trends. The same is true for food storage areas. The design of the facility should provide for increased cooler storage of fresh products.

## Service

Service industries sell a combination of products and services. These industries depend on low-ranking, hourly employees to communicate and distribute their products and services. Service industry customer satisfaction is in the hands of hourly employees. One way of ensuring the proper product/service mix is delivered is to train the hourly employees extensively in all facets of the operation, to make them the experts. This is often impossible. The type of person willing to work for low hourly wages is often unable to become an expert. If he were able, he would certainly demand more pay. Nevertheless, this is the approach used by most food service companies. The result is food service company practitioners commonly report most of their customer problems stem from "behavioral attitudes" of hourly service personnel. However, these employees are not trained to be "communicators". The fault lies with the food service manager, not the employee. One cannot perform in an area for which he has no training (see Table 13).

TABLE 13. Principal Reasons for Poor Service.

| REASON | RESPONSE | PERCENTAGE |
|---|---|---|
| Job Design | 18 | 7.8 |
| Service Staff Behavior/Attitude | 70 | 30.3 |
| Service System | 18 | 7.8 |
| Poor or Incomplete Training | 69 | 29.9 |
| Management Performance | 36 | 15.6 |
| Other (Fill in Blank) | 20 | 8.7 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

This problem is complicated by the type of training given in most food service establishments. As Table 14 indicates, most training is either "on-the-job training by management" or on "on-the-job training by other staff members".

**TABLE 14. Most Common Training Methods.**

| METHOD | RESPONSES | PERCENTAGE |
|---|---|---|
| Manuals/Handbooks | 97 | 17.4 |
| Classroom | 45 | 8.1 |
| Testing | 29 | 5.2 |
| Video | 54 | 9.7 |
| Computers | 6 | 1.1 |
| Interactive Video | 7 | 1.3 |
| On-the-Job by Management | 134 | 24.1 |
| On-the-Job by Staff | 125 | 22.4 |
| Posters, Pictures, Cards | 53 | 9.5 |
| Other (Fill in Blank) | 7 | 1.3 |

Please note that the responses and percentages are not based upon the number of participants (166) because multiple answers were possible.

In either method (OJT by managers, OJT by staff), an expert is not involved in training personnel in the behavioral aspects of service delivery. (Managers receive no instruction in behavioral modification during training process and cannot deliver it to their personnel.)

There is another method of service that is making progress in the food service industry. This method uses automation and technology to deliver service. This method is stressed in the USMC development for the 1990s.

The key ingredient in technological service delivery is to involve the customer as much as possible in the service-delivery process. This is accomplished by allowing the customer to make choices through the use of increased technology. Banks have discovered and utilized this process in their automatic teller machines. Instead of relying on tellers to deliver the services in the manner the bank wants, this industry developed improved technology to communicate with customers and let them customize their service. The same is possible for the food service industry.

The key to this utilization is based on basic organizational behavior theory. Because the customer is participating in the decision-making process he/she is much more likely to enjoy the process. Certainly, there are many areas in which this type of participatory decision making is impossible,

especially in the military. However, in decisions such as determining which food products to consume, the process is not only possible but desirable.

The addition of technology that allows customers to participate in the service process has considerable advantages beyond simply improving the level of service to customers. For instance, it reduces the need for service employee training and training costs. Because the customer is communicating with a machine rather than employees, employees need not be trained in how to communicate. They are now free to concentrate on performing tasks completely and efficiently.

However, when asked the expected level of rejection to the introduction of technology to service delivery an interesting fact came to light: The practitioners were evenly divided on the expected acceptance levels of their customers to the addition of technology to service delivery (See Table 15). This finding corresponds closely to pretests conducted by the banking industry on the potential for automatic tellers in their industry. Some customers are readily amenable to the change, while others show resistance. The key question is who resists change and who accepts it.

The fast-food industry has broken important ground in this area. Today many fast-food companies utilize systems that 10 years ago were thought to be unacceptable in terms of technology used to enhance service delivery and the level of customer participation associated with it. For instance, many fast-foods chain utilize self-service beverage counters at which customers select and produce their own beverages. Instead of supporting another employee to produce beverages for customers, the fast-food companies have purchased machines for reduced labor. Technology has caught up with the need to reduce labor requirements. As a result, the fast food restaurants are no longer afraid of losing control over the dispensing of beverages and have passed this process over to their customers.

TABLE 15. Customers' Reaction to Increased Technology in Direct Customer Contact.

| LEVEL OF REACTION | RESPONSE | PERCENTAGE |
|---|---|---|
| 1 (Well) | 23 | 13.9 |
| 2 | 35 | 21.1 |
| 3 | 36 | 21.1 |
| 4 | 36 | 21.7 |
| 5 (Poor) | 36 | 21.7 |

## Conclusion

This report has identified three major types of food service operations that are currently preferred and/or recommended for future use. These three types are: full table service (38%), cafeteria straight line (22%), and hollow square (33%). Our recommendation is to adopt the hollow square system.

According to the telephone poll conducted in FY86, the full service approach requires one key element that may not be present in all USMC feeding centers. That element is the ability to serve all patrons simultaneously. In addition, the system is considerably more labor-intensive than either the cafeteria straight line or the hollow square. The cafeteria straight line has the considerable disadvantage of each customer having to wait while other customers make selections. In addition, change is difficult in the straight line system. Because all stations of the system are dependent upon one another, redesign can be costly and ineffective. Because 51 percent of the food service practitioners surveyed believed that major renovations are required at least every 7 years, the straight line system would prove to be a costly food service alternative.

The hollow square system has the advantages of reduced line backups, more adequate utilization of current and anticipated technological advances, and the ability to change a certain station without redesigning the whole system. Personnel flow through the entry and sign-in areas in an orderly and swift fashion with the utilization of a snake-like queueing system. Not only does this reduce bunching at the sign-in station, but effectively provides the patron with the perception that the line is not as long as it actually is. This is achieved by the short, direct distance between the entry door and the sign-in station.

The hollow square system is also a space saver. Instead of a straight line serving area, the hollow square effectively permits the same amount of equipment in a smaller area of the dining hall. This represents a large advantage when renovating a small building. Finally, flexibility in redesign of serving stations is inherent to the hollow square system. Whether it is the desired replication of stations to speed customer flow or the insertion of new equipment in the servery area, the hollow square concept can adapt more effectively than present systems.

## ADMINISTRATION AND CONTROLS REVIEW

### Introduction

The purpose of this section is to present the current and projected systems of administration and controls for the food service industry. It is imperative for the Marine Corps to incorporate effective methods of administrative controls. This section reviews new options.

The primary administrative functions of food service operations have been planning, organizing, directing, staffing, and controlling. The ultimate performance of a food service system depends upon effective management.

The role of manager requires different abilities. A successful manager must combine technical knowledge, human resource capabilities, the ability to communicate with the staff, and conceptual thinking. Food service managers also have a number of resources at their command: personnel, materials, facilities and financial resources. All these abilities are used in the problem-solving and decision-making process.

USMC administrative controls are inefficient. A significant portion of the manager's time is spent on paperwork rather than on managing. Productivity is also hampered by cramped work spaces and a limited application of computers, which prevent an already overburdened staff from performing at optimal levels.

Computerization of menu planning, food ordering, food storage, and recipe preparation is still in the development stage. Currently, food cost controls and standard recipes are being updated, resulting in more efficient programs for scheduling and food preparation becoming more efficient. Continuing education programs for food service managers focus on further professional training and better management controls.

### Food Service Information System

The rational decision-making process requires four steps: definition of the problem, analysis of information, consideration of alternative choices of action, and selection and implementation of the chosen solution. Computerization can assist the manager in this process by performing repetitious "what if" scenarios designed to provide alternatives for consideration.

The support system selected should be designed to facilitate decision making by managers rather than clerical or operational transactions. The types of decisions most food service managers make fall into two categories: (1) managerial activity (operational and management control and strategic planning) and (2) types of decision task (structured, semistructured and unstructured). Therefore, the intent of a system is to apply technology to aid the manager in making these types of decisions.

Computers were first used in food service to calculate food costs, monitor customer headcounts and store pertinent information. They were then used to forecast consumption levels of products to maintain proper inventories. Computers have evolved into one of the major tools of the food service

industry. Food service operations are now able to track large numbers of products and transactions easily and provide cost information for planning and forecasting.

Through computer use, a manager can select a menu based on availability of products, seasonality, climate, food prices, eating preferences, and nutritional goals. It is essential that standardized recipes are scaled to the proper volume. Appropriate quantities of food required can then be purchased. The use of a computer to perform such functions affords the food service manager the opportunity to devote more time to management and decision-making tasks.

A food service information system should address the following:

- Menu Analysis
- Labor Productivity
- Financial Planning
- Inventory Management
- General Accounting
- Internal Control

Menu Analysis. Here, the sales of individual menu items are tracked and through comparison to the sales levels of other items establishes a "menu mix". This mix allows a manager to determine the sales of a particular menu item. Preferences of the customer can be established and taken into account when planning future meals.

Inventory Management. This aspect represents an area where considerable savings have been realized with the introduction of computers. This system is designed to track and control a food service establishments most important commodity, its food. A food item can be tracked from the moment it is ordered to the moment it is consumed. Information pertaining to that item can include when it was purchased, from whom, for how much, where it is stored, who it was issued to, and when it was prepared and consumed. This facilitates the keeping of a perpetual inventory and thus the status of an inventory can be assessed at any time. Establishment of "par" stocks allows the computer to forewarn of low inventory levels and therefore simplify ordering. When physical inventories are taken, a comparison of the real to the theoretical inventory can point up lost items, possibly due to waste or theft. A standardized recipe file is usually included in this system. This allows for "recipe scaling," where the amount and total cost are calculated. An entire menu can then be calculated and the total amount of each ingredient can be determined. This information is compared with the inventory file, and purchase orders can be generated if needed.

Labor Productivity. This can be determined with a time clock inputting data to the system. A comparison of man hours worked to food produced and served, allows a manager to determine the level of productivity of his employees, and allows his superiors to assess his effectiveness as a manager. This data can also tie into the accounting system to calculate payroll.

General Accounting. These systems include functions for purchases/accounts payable, cash collection and disbursement, sales journal, payroll, general ledger, accounts receivable and financial statements.

Financial Planning. This falls more into the realm of decision support than any of the other systems. Based on sets of assumptions, goals, historical

data, and expert opinion, forecasts can be made to support the planning function. This is the area where simulation models can be constructed, assumptions manipulated, and results compared. Great care must be taken in building models to ensure that results are truly related to the assumptions the simulation is based upon. In an institutional setting, this function can aid in selecting menus, forecasting consumption and drawing up realistic budgets.

Internal Control. Care must be taken that food items ordered are of sufficient quantity and optimum price. The system acts as a receiving record and updates inventory information. Issuing controls ensure that inventory is properly rotated and tracked. Production controls ensure that only the food required for production is requisitioned and that prepared amounts are delivered for service. Finally, service controls check that prepared food is actually delivered to consumers.

All of these functions should be integrated so as to achieve the following Food Information System objectives:

- Eliminate or reduce the number of source documents;
- Eliminate or reduce the number of redundant, data transfer and recording procedures;
- Provide management with timely and comprehensive reports;
- Enable management to make better decisions;
- Provide cost savings to the establishment; and
- Enable the establishment to provide higher quality service and products.

## Productivity

Boosting productivity can be a key to solving problems in a food service system. Productivity affects the number of meals served, menu, type of food purchased, number and length of meal periods, kind and arrangement of equipment, experience and training of employees as well as the supervision required. Most industries define and measure productivity in relation to the finished product. Yet in food service, there is no universal measure. The National Restaurant Association has stated that the food service industry is only 50% as productive as the manufacturing industry. The food service industry is also unique in that a raw product is put together and sold in the same location, production has peaks and valleys, and food service employees have little moment-to-moment supervision.

Accurate job design is a necessary ingredient to increased productivity. In addition, selecting the right person for the job is important. Many areas provide the opportunity for improvement of productivity and service while ensuring effective use of all resources rather than by merely utilizing additional man hours. Productivity can be enhanced by increasing personnel efficiency through work simplification and work organization principles. Proper scheduling improves productivity by minimizing incomplete jobs and ensuring that the jobs are done on time. The key factors in increasing productivity are keeping employees to a minimum, training, and menus with a minimum of steps. These factors should be an integral part of administrative policy.

## Receiving and Inventories

The economic quantity method of ordering is most suitable for operations which use cyclical menus. This type of operation requires established minimum and maximum stock levels and uses a perpetual inventory system. In such a system, detailed issue data, available on a daily basis, is an invaluable ingredient in the control process and provides a key to product quality and consistency.

Another area of control is that of deliveries. Currently, computerized receiving stations use hand-held scanners (a bar code reading device). These scanners are connected to a computer so that at the completion of deliveries the computer automatically processes the information to provide a detailed list of items and extended prices for each item received. Prices are then compared on invoices to screen for unauthorized purchases. This information is then transferred by computer to the accounting department. Because there is no key punching required in the system, errors are kept at a minimum. This scanner system interfaces with a perpetual inventory system. The same scanners are also used in the storeroom for accounting purposes.

## Sanitation

The goal of a sanitation system is to ensure food quality, purity, and safety. Food service sanitation procedures should include potential safety hazards and how they may be prevented and avoided. Well-written specifications are necessary to communicate these safety requirements to food service personnel.

Most sanitation hazards fall under the following categories:

- Time/temperature relationship
- Freezer/refrigerator storage
- Personnel practices
- Cleaning and sanitizing procedures

A well-run sanitation program provides several economic benefits. These benefits include decreased maintenance and equipment replacement costs, increased worker morale (which increases productivity), and higher product quality. The programs can lead to improved use of products, less waste, and more efficient food control. For the program to reap maximum benefit adequate supplies, equipment, and cleaning time must be provided.

Sanitation in most receiving areas can be increased to prevent the entry of contaminated or spoiled food products. A detailed inspection of foods prior to acceptance can also save money. The storage area should be designed to reduce product deterioration and spoilage. In all cases, a manager must monitor dry, refrigerator, and freezer storage space. This is done by inspecting highly perishable items on a daily basis. All food products in storage should be labeled, dated, and kept covered or wrapped in moisture proof, airtight materials to guard against cross-contamination.

Proper thawing is also important. Products must thaw under refrigeration at 45°F and should not be refrozen, as this will cause quality deterioration and (possibly) microbiological growth. The basic rule of holding food products

is to either chill them rapidly or keep them at temperatures above 140°F for serving.

Menu items can be contaminated by customers or servers. Service personnel frequently handle eating utensils incorrectly and pick up items with their hands, causing considerable contamination. Proper training can eliminate most of the potential problems with employees.

Proper sanitation in the dishwashing area is also very important. Some systems allow for dishes to be cleaned and sorted using ultrasonics (sound waves that vibrate the dishes clean). Some systems allow for automatic counting, weighing, sorting, and inspecting by robotics.

## Conclusion

The kitchens of the future will have robotics in the dishwashing area, but also in the areas of purchasing, inventory control, nutritional planning, and portion control. Computers will test textures, temperatures, and colors. The kitchen of the future could have a robotically controlled inventory and warehousing system and use holograph pictures for food preparation and training.

Food service managers in all industries are under increasing pressure to adapt to technological change, utilize new market forms of food, create alternative food production systems, devise better meal delivery systems, and use computers to process information. In the end, the increasing cost of these measures will require careful planning and control of resources.

## PRODUCTION REVIEW

### Introduction

There are a number of steps a food item must go through before it becomes a final product. The process begins with the production of the raw product. Food service operators are not involved in this area. The raw product is acquired through a food distributor. Some degree of processing may have already occurred prior to receiving a product. The amount of processing may range from receiving a raw ingredient to receiving a ready-to-serve menu item. Many food service organizations utilize products covering this whole range. Decisions concerning the degree of processing are made in the menu planning state and executed through the purchasing function.

Upon arrival at the food service establishment, the product is received and stored. The product is then issued and enters the first step in internal production: preparation. Preparation converts a product to make it ready for inclusion in a specific menu item. The next stage combines the ingredients to create a final product. The menu item must then be kept at the proper temperature and served to the customer. The final stage calls is cleaning of the production areas (see Figure 1).

Refer to Appendix A for information on preparation, service, and cleaning equipment.

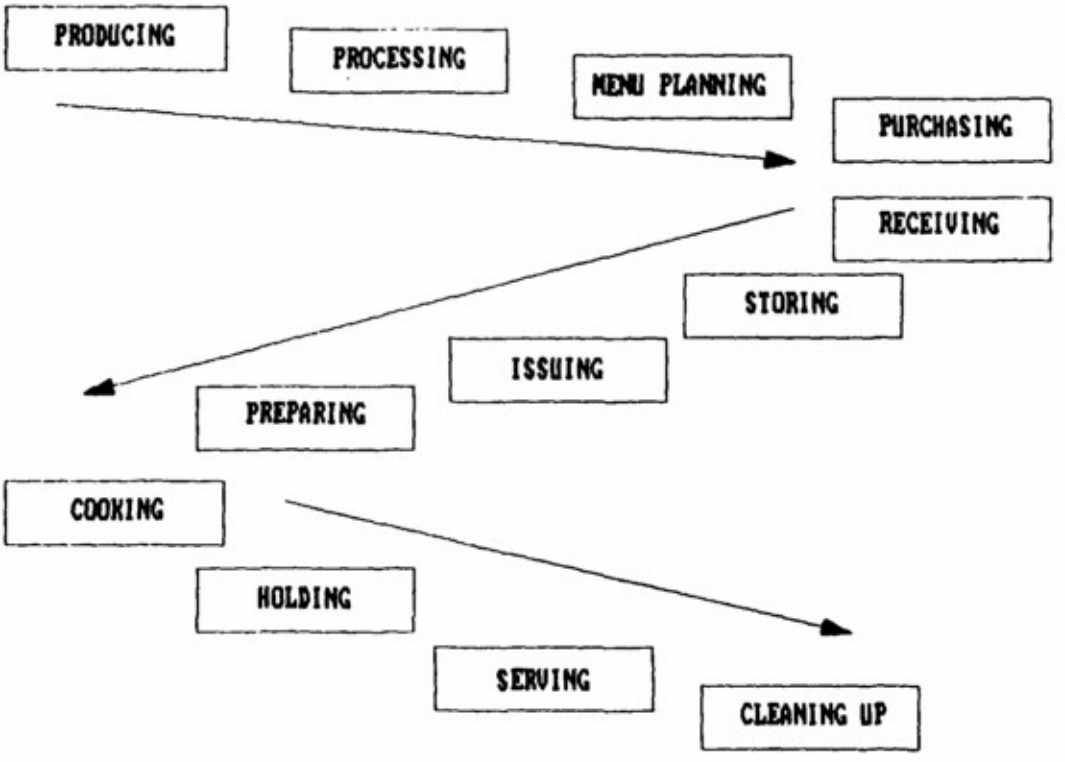


Figure 1. Food service process.

## Classification of Food Service Systems

Most food service systems use a variety of foods at varying degrees of processing. The degree to which a food service operation uses processed food affects product flow, required skill levels of personnel, and areas of management focus. Some organizations attempt to use as many processed foods as possible while others avoid them at all costs. Taking this variance into account, four different types of food service systems can be identified:

(1) convenience or assembly/serve,
(2) conventional or traditional,
(3) ready-prepared, and
(4) commissary.

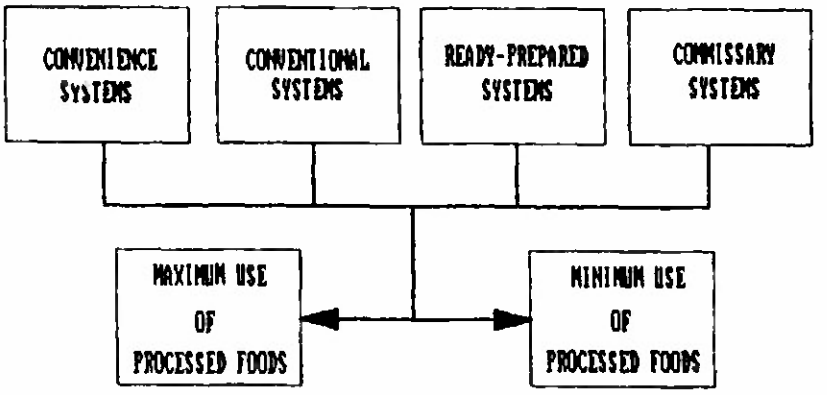


Figure 2. Types of food service systems.

Convenience Systems. Convenience systems use products which have undergone maximum processing. The skill level of employees need not be particularly high and equipment requirements are limited. Equipment typically includes microwave ovens, steamers, and convection ovens. Food is generally received in a frozen, bulk, preportioned or preplated state. Many of these products are ready to heat, while others may require some preparation.

Advantages of the convenience system include low production and labor requirements. There is a reduced initial investment due to lower than usual equipment requirements and less space devoted to the kitchen. Limited menus coupled with reduced system complexity results in increased productivity, tight labor controls, and a reduced need for highly trained personnel.

Disadvantages of this system include higher prices for food and limited selection. Commitment to this system also includes a dependence on the supplier. This dependence can create problems in stocking and pricing. Perhaps the largest obstacle is the lack of consumer acceptance of these

products. Some fast-food companies have managed to overcome many of these problems. Companies such as McDonald's have successfully controlled product quality via a large investment. The consumer has also shown a willingness to forego traditional bias to convenience foods in the interest of saving time. Further discussions on convenience foods are included in Appendix B.

Convenience foods have emerged with the growing shortage of labor and the availability of processed food. They do provide a viable alternative to the labor problem. Convenience systems also need to take steps to continually improve the quality and consistency of the product.

Conventional Systems. The conventional system consists of the traditional approach to food service. Raw materials are brought in and production takes place on the premises. Older style establishments have a butcher, bake shop, and vegetable preparation station. Use of these areas is less commonplace due to many establishments using preportioned meats, processed baked goods, and frozen prepared vegetables. The product still undergoes preparation immediately prior to service. The conventional system is more complex than the convenience system since more of the production process is executed on site. The system requires more equipment, higher skill levels, additional kitchen space, and increased energy consumption. Since food is produced to closely coincide with service, maintaining maximum nutrient and sensory quality and minimizing potential bacteriological problems becomes a prime concern.

The advantage of this system is the production of a high quality product on the premises. There is a high degree of control over the final product. This system has been the choice of independent restaurateurs. Disadvantages are high labor requirements and problems in coordinating the production schedule to maintain quality. This system may not be the best choice for an institutional feeder. Other systems offer considerable savings in labor and production requirements while sacrificing little quality.

Ready-Prepared Systems. The ready-prepared system originated when the airlines could not find high quality pre-processed food available for use on the airplanes. The answer was to bring in material and create convenience foods. After processing, the product is either frozen or chilled (cook/chill and cook/freeze are types of ready-prepared systems). Items are heated during production and prior to service. Microwaves, convection ovens, and steamers are commonly used for the final heating. Managerial concern centers on maintaining quality of the product through repackaging and storage. Adjustments must be made to minimize nutrient loss and avoid deterioration of flavor or texture. Special care must be taken to prevent bacterial contamination.

Greater control over the production process is the major advantage of this system. Product consistency is easier to maintain and waste can be controlled more efficiently. This system utilizes the concept of stored labor. The production schedule is determined by projected future demands, not daily needs. Production peaks and valleys are eliminated and personnel can work regular hours (this system also requires fewer skilled employees). The major disadvantage of this system is the large capital investment required for storage facilities and equipment.

This system was established so that unskilled labor could perform final preparation of a product using minimal equipment. It lends itself to airlines, hospitals, schools and catering situations. Problems can arise from consumer acceptance of airline food, but continual advances in packaging and rethermalization technologies indicate a growing interest in this type of system.

Commissary Systems. There are many similarities between the commissary system and the ready-prepared system; however, the objectives of the two systems are somewhat different. Commissary systems are characterized by centralized food procurement and production with distribution of prepared products to remote areas for final preparation. This system depends on large-scale purchasing to receive discounts and preferential treatment from food distributors.

Product flow begins with procurement and storage. The food is issued for preparation and processed to varying degrees. The product is then repackaged, refrigerated or frozen. The food is distributed to service facilities where it is prepared and served. As in the ready-prepared systems, managers are concerned with packing and storage problems. Managers are also concerned with coordinating the movement of the product from the commissary to the satellite kitchens.

Advantages of this system include the previously mentioned benefits of centralized purchasing and production. Due to the centralization of production, control of the product is enhanced and waste is easier to control. This also means that space and equipment requirements of kitchens in the satellite facilities are reduced. Due to the stored labor concept, production is characterized by a steady, organized work flow and scheduling of personnel is simplified. Disadvantages of the system include a substantial investment in equipment, logistical problems in packaging and transporting the product, and coordinating equipment and container return to the commissary kitchen.

The commissary system evolved as companies with similar operations located in a relatively small geographic area decided to take advantage of economies of scale. Many of the same tasks were being performed at all company units on a daily basis. Consolidation of effort resulted in lower staffing requirements of skilled personnel and a more consistent product. More and more multi-unit operators are turning to the commissary system to combat rising food and labor costs.

## Organizing Production

Organizing production consists of taking a menu plan, determining the necessary tasks and activities to bring the plan to life, and then coordinating these activities. The production schedule is the fundamental tool for organizing production. The first step in scheduling is to assign the various tasks to production stations in the kitchen. Human resources and equipment are allocated to perform specific tasks. The tasks are organized on a time schedule so that various pieces of equipment are not being utilized at the same time, the staff does not have conflicting time demands, and production is completed on time. Each staff member should be provided with a personalized production schedule each day which informs him/her of the following:

1. Employee name,
2. Menu item (identifies recipe by name),
3. Quantity to prepare (the forecasted amount),
4. Actual yield (as described in the recipe),
5. Special instructions and comments (equipment to be used and any information not included in the recipe),
6. Time schedule (establishes standard for achieving each task), and
7. Substitutions (acceptable replacement).

Taking these steps helps to ensure an even flow of production and timeliness of needed food items.

Controlling Production--Operations

Many measures can be instituted to control quality, consistency, and efficiency. Commonly used tools are standardized recipe, sanitation standards, quality control programs, portion control, yield tests, and time/temperature standards.

Recipes should be standardized and easy to read and understand. The recipe should include the following information:

1. Name of item
2. Recipe yield
3. Portion size and total portions yielded
4. Preparation time
5. Cooking time
6. List of ingredients
7. Ingredient amounts
8. Procedures
9. Serving information

Armed Forces Recipe Cards provide this information and effectively direct production of the menu item. Individual creativity in altering the item for specific tastes should not be discouraged. Acceptance of the product by the consumer is always the goal.

Establishment of sanitation standards is absolutely essential to meet governmental regulations and to ensure a quality product. Education and training of staff in personal hygiene and food handling techniques are critical to implementing an effective sanitation control program.

The goal of quality control is consistency of product. Consistency begins with time/temperature controls. Cooking is a function of these two elements. The operator is at the mercy of his/her cooking equipment. Thermostats must be checked periodically for sensitivity and accuracy. Thermometers should be carried by all cooking personnel to measure internal product temperatures. Timers should be present in the kitchen. Computerized timing and temperature controls are available and will soon be standard on most cooking equipment.

Portion control contributes to product consistency as well. By establishing portion standards, controlling costs and planning is easier. Portion control begins in the procurement phase. Many convenience products are preportioned. Portion sizes are defined in standard recipes. Knowledge of

pot, pan, and serving utensils allows for planned measuring of the product. Scales are of great help, and newer, more accurate, easier-to-clean electronic scales aid in preportioning. Portion control is essential to planning and costing of menus. Implementation of these standards results in a consistent economical product.

As a product moves through the production system, losses in volume and weight are likely to occur. The amount of servable product at the end of production is the product yield. These losses are due to cooking and handling. The objective of yield control is to minimize the losses. In preparing food, portions of the product may not be usable and must be discarded. Standards must be established and processes monitored to prevent too much trimming of usable product. Cooking losses occur primarily due to moisture loss. Proper use of equipment and cooking methods can minimize loss. Monitoring of employees is necessary to ensure guidelines are followed.

A well-organized and implemented production control program can result in cost savings and a consistent quality product. Planning establishes policies, procedures, and standards. Implementation involves continuous educating and training of a staff. Monitoring of the production process ensures completion of program objectives.

## Controlling Production--Labor

Labor control is comprised of staffing, scheduling, and productivity measures. Staffing is a planning activity which determines the number of personnel needed to operate a facility. Necessary skill levels are established and job descriptions are generated. The type of food service system and menu define the types and number of personnel needed at any particular time. Scheduling answers the questions of who works where and at what time. Staffing is long-term, while scheduling is short-term.

Scheduling can be a complicated process, especially in a 24-hour, 7 days a week operation. A number of approaches used in scheduling employees include the following:

1. Standard 40-hour week,
2. Split shifts (working two or more separate shifts a day),
3. Compressed work week (four 10-hour days),
4. Flexible scheduling (where employee determines length of shift, start and stop times), and
5. Part-time.

The choice of approach is determined by operational objectives and employee desires. In any event, the manager is responsible for a master schedule or overall plan and needs to plan for accomplishing operational tasks.

Worker productivity is influenced by a number of environmental, organizational, and managerial factors. Environmental factors are determined during the design of the facilities and include the following:

1. WORK FLOW--As the product progresses through the production system, movement should be from procurement, to preparation, to cooking, to service, with a minimum of handling. Workers from different areas of

the kitchen should not have to cross paths to get to equipment and utensils. Proper aisle space should be provided.

2. WORK CENTER--Individual work stations should be designed with proper table heights and with the flexibility to perform all required tasks with a minimum of time-wasting movement.

3. CONTROL OF HEAT--High temperatures are not uncommon in the kitchen and proper ventilation must be provided to allow workers to work at optimal levels.

4. KITCHEN ILLUMINATION--Proper lighting is absolutely essential to high worker productivity. Workers must be able to judge appearance of food in process, read recipes, and safely handle equipment.

Consideration of these factors is necessary during the architectural design of a facility to ensure a safe, comfortable place for production.

Training, for the most part, consists of learning how to handle the various machinery used in food production. While it may not take time to train a person in the performance of specific jobs, it may take some time for a worker to develop the familiarity with the kitchen environment and the organizational skills which will bring him/her to the highest levels of productivity.

Cooking is the most complex of the skilled positions in the production system. As stated previously, cooking is a combination of art and science, requiring a fair amount of judgement. This judgement is gained through experience and training. Due to the differences in lengths of cooking times and delays between steps in a recipe, a cook will have a number of items cooking at once. It requires organizational ability to coordinate these various activities and produce a consistently good product. Most cooks begin their careers in preparation and work their way up. Because of this experience, cooks tend to be versatile kitchen workers. Given the proper environment, cooks can be among the most productive members of the food service staff.

Organizational factors consist of providing a system which is well-planned, implemented and controlled. Basically, these factors are determined by the choice of approaches in dealing with topics addressed in this paper. An organized system will help an employee understand his/her tasks and his/her role in the organization leading to an enjoyable, productive working experience.

# SERVICE REVIEW

## Introduction

The USMC food service facilities are faced with several service problems which require immediate and long-term solutions. Among those problems are substantial competition created by introduction of fast food franchises on military bases. Inefficient facilities and systems for food delivery, and a pressing need to redefine "service" as it relates to the USMC food services. The first and often most difficult step in problem solving has already been accomplished.

The service provided in a food service facility determines, the degree of consumer satisfaction with the product. Research indicates there are 10 dimensions consumers use in forming expectations about and perceptions of services. Those 10 dimensions and brief definitions are listed below:

(1) Reliability--consistency of performance, delivers on promises,
(2) Responsiveness--willingness of employees to provide service,
(3) Competence--possession of required skills and knowledge,
(4) Access--approachability and ease of contact,
(5) Courtesy--politeness, respect, consideration of contact personnel,
(6) Communication--discuss service in terms consumer can understand,
(7) Credibility--have consumers best interests at heart,
(8) Security--freedom from risk and doubt,
(9) Understanding/knowing the customer, and
(10) Tangibles--appearance of personnel and facility.

It is evident that people involved in food service operations play an important role in delivering service. The customer compares these expectations versus the performance with which he comes in contact. Since these contacts are delivered most often by food service personnel, it is mandatory to establish a program for training, retraining, evaluating, and developing food service staff.

## Customer Perception

Success in food service operations is determined by perceptions the customer has of the service. To illustrate; an object that seems "white" to one person may be beige or a very light brown to another. Each perception depends on the prior experience a person has had in differentiating the differences between shades of colors. The purpose in a food service operation is to instill in the customer a single perception (hopefully positive) of what to expect. This perception is accomplished through (1) knowing your customer, and (2) educating your customer towards positive expectations.

How can you know what your customers' expectations are? One way is to try to see the food service operation through customers' eyes. Because food service personnel are close to the action and more fully understand the total system, they may have a different perception than the customer. However, effective management requires the shedding of personal opinions and biases, and initiating actions to determine customer attitudes to the operation. Surveys,

questionnaires, and food service audit panels all provide a source of information as to customer likes and dislikes.

Human Resources

To help staff perform service at an optimum level, these steps should be followed:

(1) set measurable service levels (such as the time to perform each function, the number of eye contacts required, etc...);

(2) define the job design of each task;

(3) define and document procedures of how each task is performed;

(4) establish a system of consumer feedback to regularly assess acceptance of service (both solicited feedback and unsolicited complaints and compliments);

(5) establish internal assessments through supervisory observations, operating audits, and analysis of operations combined with evaluations of personnel; and

(6) establish a system for assessing behavioral characteristics exhibited by staff and management.

Ideally, measurable service levels should be established in conjunction with participation by on-line staff members. Research to date has indicated that if staff members are given the opportunity to participate in this form of decision-making consensus is much higher and adherence greater. In addition, by involving staff members in the determination of acceptable levels of measurable service criteria, the management team will become more informed regarding the perspective of staff members toward the "hands-on" responsibilities of each task.

The second step is training. Many food service managers believe the standard way of doing things should always be followed. Defining and documenting the procedures of how each task is performed does not train staff members. Procedures and definitions only establish the standards and goals of each step of service delivered. These guidelines must be clearly written in terms the reader will understand.

Customer evaluations provide feedback required for assessment. For Marines, this can be accomplished through periodic customer surveys, customer comment cards, unsolicited complaint or compliment cards, or a combination of all three. The unsolicited comment card alone is not likely to establish any values for evaluation because only certain types of people generally respond and comments are directed toward specific incidents which do not represent significant attributes of the performance.

The internal assessment of operations can be undertaken by either supervisory staff personnel or outside assessors. Published research is divided on the most acceptable means. This assessment should include an inspection of written procedures, the physical plant, and equipment and

observations of employee performances. This is currently accomplished by Marine Corps Food Service Management Teams. Consideration should be given to more frequent analysis of operations both externally and internally.

## BIBLIOGRAPHY


Armstrong and Sinka, Pavid, Balintfy. Journal of Food Service Systems, Winter 1982, pp. 47-58.

Axler, Bruce. Buying and Using Convenience Foods. Indianapolis, Ind.: ITT Educational Publishing, 1974.

Axler, Bruce H. Food Service: A Managerial Approach. William C. Brown Company, Publishers, 1979.

Brendel, Evalyn and R. J. Brikle, Patricia Rose, K. R. Bordeauz, Vera Jenkins. "Strategies for Increasing Productivity," The Journal of the American Dietetics Association, August 1985, pp. 966-9.

Campbell, Chelene R. D. "The Enhanced Productivity Program," The Journal of the American Dietetic Association, November 1985, pp. 1479-82.

Chin, George Ray. "Kitchen Design to Improve Employee Productivity," unpublished M.P.S. monograph, 1982

Cummings, Gil. "The World of Microwaves," Restaurant Business, May 1, 1984, pp. 205-207.

Gindin, Rona L. "Sanitation: The Competitive Edge." Restaurant Business, (December 10, 1984) 210-214

Kassavana, Michael L. Computer Systems for Food Service Operations. New York, 1984.

Kazarian, Edward A. Food Service Facilities Planning. Westport, Conn.: AVI Publishing, 1983.

Knight, John B. and Kotschevar, Lendal H. Quantity Food Production: Planning and Management. Boston, MA: CBI Publishing Co. Inc., 1979.

Kotschevar, Lendal H. Quantity Food Production. Boston, MA: Cahners Books, 1974.

Matthews, M. Eileen. "A Food Service Information Framework for Decision Making," Food Technology, December 1983, pp.46-49.

## BIBLIOGRAPHY (cont'd)


Matthews, M. E. and J. P. Norback. "A New Approach to the Design of Information Systems for Food Service Management in Health Care Facilities," Journal of the American Dietetic Association, June 1984, pp. 675-8 and 681.

Minor, Lewis J. and Ronald F. Cichy. Food Service Systems Management. Connecticut: AVI Publishing Company, Inc., 1984.

Myers, James R. Commercial Kitchens, Arlington, VA: American Gas Association, 1979.

Pedderson, Raymond B. et al. Increasing Productivity in Food Service, Boston, MA: Cahners Publishing Co. Inc., 1973.

Powers, Jo Marie and Thomas F. Powers. Food Service Operations: Planning and Control, New York: John Wiley and Sons, 1984.

Snyder, Oscar. "A Management System for Food Service Quality Assurance," Food Technology, June 1983, pp. 61-67.

Spears, Marian C. and Allene G. Vaden. Food Service Organizations: A Managerial and Systems Approach, New York: John Wiley and Sons, 1985.

Taubert, Carl. "Defining Sanitation Hazards and Critical Control Points in Food Service Operations," Journal of Food Service Systems, Winter 1982, p. 171-175.

Terrell, Margeret E. Professional Food Preparation, New York: John Wiley and Sons, 1971.

West, Bessie Brooks et al. Food Service in Institutions, New York: John Wiley and Sons, 1977.

Wilkinson, Jule. The Complete Book of Cooking Equipment. Boston, MA: CBI Publishing Co. Inc., 1981.

Wrisley, Albert L. "Food Cost Controls for Hotels Part I. Current State Needs of the Industry," Journal of Food Service Systems, Winter 1982, p. 59-69.

Wrisley, Albert L. "Food Cost Controls for Hotels Part II. A Computerized Food Planning and Controls System," Journal Food Service Systems, Winter 1982, pp. 95-125.

# APPENDIX A.

## Food Preparation Equipment

## APPENDIX A.

## Food Preparation Equipment

### Selection of Proper Equipment

In choosing equipment, one should consider present and future needs. Therefore, equipment should be selected that allows for flexibility in food service needs. Many food services are designing kitchens with movable equipment and temporary utility hook ups. The American Gas Association suggests a six-step process to determine equipment needs:

1. Select a good sampling of potential menu items.

2. Determine the potential number of menu items to be served and their portion size.

3. Multiply number of menu items by portion size to determine total amount of food to be processed.

4. Calculate serving demands for the items, in other words how many items will you need to be able to produce in a specified time to meet peak demand.

5. Obtain information on equipment specifications and production capabilities.

6. Calculate the size and number of pieces of equipment necessary to meet the demands of the menu and service.

### Precooking Equipment

A variety of machines are available which are useful for food preparation. Key elements are dependability, durability, ease of cleaning, and safety. One must also consider whether a machine actually suits an operation. Manufactures of kitchen equipment are continually introducing new or more complex machines. The trend has been towards designing machines for one specific function, such as a pizza-making machine. The manager must decide if the the machine will be used enough to justify a large capital investment. Below are samples of such machines that have proved useful.

Slicer. The slicer consists of a mechanically driven, rotating, circular blade and a guide for food. They are well-suited for slicing of cold cuts, cheese, vegetables, and fruits. An adjustable guide allows for slices of varying and uniform slices. Some slicers have attachments designed for specific tasks, such as slicing tomatoes. There are models available with motor-driven guides. This means that a kitchen worker can place a product on the slicer, turn it on, and the slicer will continue feeding the product through the slicer while the worker engages in another activity. Some even have conveyors attached which will automatically stack the sliced product.

Buffalo Cutter/Chopper. This consists of a rotating bowl which passes food through the path of a spinning blade. Food can be passed through just a

few times to achieve a rough cut, or passed through a number of times to reach a very fine grind or puree. Many of these machines also have a port for inserting attachments which can slice and grate food, or grind meat. These machines have the capability of processing several quarts at a time.

Vertical Cutter/Mixer. It is similar in concept to a blender--a bowl with motor-driven blades at the base. It is well-suited to jobs such as cutting lettuce for salads or pureeing soups. It will perform many of the same functions as the much smaller food processor. The machine is available from 10 to 130 quarts.

Food Processor. The food processor has emerged as a compact workhorse for many food service operations. This machine has a wide range of capabilities to include slicing, dicing, chopping, pureeing, grating, julienning, pasta extruding, and ice cream making. The speed and versatility of these machines has resulted in their becoming an indispensable part of the modern kitchen.

Automated Peeler. A peeler consists of a water-filled container coupled with a rotating, abrasive disk. The food item is placed in the machine and the abrasive disk gently removes the peel. There are a variety of sizes of this unit. For high volume peeling this machine can be a real timesaver.

Egg Separator. This tool uses centrifugal force to separate the yolk from the white for large quantities of eggs.

## Cooking Methods and Equipment

The next step in the production process involves the combining of prepared elements to create a finished product.

Broiling. This method of cooking relies on infrared radiation to properly heat the food, often with a heat source providing very high heat. For this reason, broiling is a delicate affair. The trick is to heat a food item thoroughly without burning the exterior. This form of cooking has recently seen a strong resurgence. This method is not energy efficient. Considerable heat escapes from the top of a broiler without being utilized.

### Horizontal Broilers.

These are typified by an overhead heat source, a moving grid to adjust the distance from the flame, and a ventilating system which helps retain heat while removing cooking fumes. High production infrared broilers of this type have the ability of preheating in 60 seconds and cooking a 1-inch steak in 5 minutes. These broilers can be easily stacked and in some models heat is recirculated to a finishing oven on top of the broiler.

### Char Broilers.

Char broilers are the type most commonly seen in specialty restaurants and are the source of barbecued items. The heating elements for this type of broiler are situated under the grill and can be either gas fired or electric. Fat dripping from food on to the hot coals creates the "charbroiled" flavor. Cooking with this type of equipment requires a fair amount of skill and judgment, since the heat source tends to be uneven.

### Specialty Broilers.

These perform specific tasks. The one most commonly seen in high volume operations is the conveyor broiler. Food is placed on a conveyor belt and moved horizontally through a tunnel with heating elements above and below the product, eliminating the need to flip the product during cooking. A number of options are available for these machines which virtually eliminate the judgement needed for other types of broiling. Although this type of cooking does not require much skill, the items on the conveyor belt must have similar cooking requirements. Consequently, these broilers have seen the greatest acceptance in high volume hamburger operations.

Baking. Baking involves the surrounding of food with heat radiated from the walls of an oven. Baking temperatures typically range from 300°F to 500°F. Baking is a dry heat method of cooking and tends to dry the surface of foods. This tends to work well with meats and bakery items. This is a highly used form of cookery, particularly in high volume, institutional food production. Ovens can be found in large variety of shapes, sizes, and designs. The different types of ovens are as follows.

### Deck Ovens.

A single layer oven designed to accommodate standard size baking and roasting pans. The height of the oven is determined by the purpose. An oven designed for baking can be short and stacked. Ovens for roasting meats will be tall and can usually be found tucked beneath ranges. Common applications include roasting meats and baking bread.

### Convection Ovens.

Food is comprised predominately of water. As food is heated, this water evaporates and creates a boundary of cooler air surrounding the food. A convection oven forces air into circulating inside an oven, thus disturbing the insulating barrier and speeding up cooking. Sizes vary from counter top models to mobile ovens with an 18-shelf rack. New models have programmable timers. A roast can be placed in the oven to slow cook overnight and once it is ready, the heat is reduced to a holding temperature.

### Slow-Cooking Ovens.

Slow-cooking ovens minimize the amount of moisture loss during cooking resulting in much higher post cooking yields. They have the additional benefit of providing a very tender product. This can be achieved with either of the previously mentioned ovens, but there are now specially designed cabinets for this purpose. They are powered electrically, have wheels, and can be twice the size of a standard convection oven, although a variety of sizes are available. These slow-cooking ovens provide an excellent means for cooking meats and holding any type of food.

### Pizza Ovens.

Pizzas hold a large amount of water and require an oven which will heat from the bottom to produce a crisp crust and heat from the top to melt cheese. The base of the oven is a heat-absorbent material, such as stone or a

steel plate, allowing heated air to transfer to the topping. These are short ovens that can be easily stacked.

Conveyorized Ovens.

This oven is a combination of the convection oven and a conveyor belt and operates much the same way as the specialty broiler.

**Moist Heat Cooking.** Boiling, steaming, blanching, braising, poaching, simmering and stewing represent moist heat cooking. This method is very efficient. Energy is continuously and rapidly transferred to the food. The maximum temperature for boiling is 212°F; however, steam can be used under pressure to achieve greater cooking temperatures. Cooking with liquid heat requires little skill. Once liquid reaches its boiling point, temperature will not increase no matter how hard or long heat is applied. The equipment used in moist heat cooking is listed below.

Steam Jacketed Kettle.

Similar in concept to a double boiler, the steam jacketed kettle consists of a large pot surrounded by a second pot, separated by a small space through which steam circulates under pressure. Steam circulates in this gap and condenses as it hits the inner jacket, releasing its energy. The jackets commonly surround two-thirds of a kettle, providing for an even distribution of heat. Sizes vary from 1 quart to 200 gallons. Temperatures up to 300°F can be achieved in these kettles. This type of kettle brings water to a boil in about half the time of a pot on a range using about one-third less energy.

Compartment Steamer.

The other type of steam equipment involves the direct application of steam to food. These steamers come as large as 36 inches wide by 33 inches deep and can be stacked for better utilization of space. They generally cook under a slight pressure of 5 PSI (pounds per square inch) and reach temperatures of 228°F. These units can be used for vegetables, poultry, meats, fish, cereal products, eggs, fruit and starch products.

High Pressure Steamers.

These units are smaller than the compartment steamers but can generate temperatures of 254°F at 15 PSI. This results in a faster cooking time, but these steamers are only useful for quickly cooking small quantities of food.

Pressureless Convection Steamer.

Gaining in popularity in recent years is the pressureless steamer or convection steamer. Again, these are smaller units, and because they do not cook under pressure, the door to the unit can be open and closed for checking, stirring, or removal of food. Air is purged from the steamer compartment and pure steam is circulated freely by fan or injection jets. This unit has proven useful for high-speed defrosting of frozen foods and for fast gentle cooking of foods at low temperatures.

Direct steam cooking has become widely used in the past several years, due in part to the ability of steam cooking to preserve nutrient qualities of food and its ability to cook fresh as well as convenience foods.

Frying. Frying is accomplished in two different ways. There is pan frying, or sauteing, and there is deep-fat frying. Pan frying uses a layer of oil to conduct heat, prevent sticking, and supply flavor. Because oils can be heated to high temperatures, browning of food occurs, producing intense flavors. As with broiling, pan frying requires skill and is usually conducted on a range or griddle.

Deep-fat frying requires the complete submersion of food in heated oil. A high heat is maintained to create a barrier of steam around the food, keeping oil out and preventing grease-soaked food. The following types of fryers are used in deep-fat frying.

Conventional Fryers.

This is a basket-type fryer. Food is placed in a wire basket and lowered into the hot fat. These fryers range from small counter top models to large freestanding fryers. New options include computerized controls that raise and lower baskets automatically and sound an alarm when the food is ready.

Conveyorized Fryers.

Similar to other conveyorized equipment the conveyorized fryer can continuously produce fried foods. Food is placed on one end of the conveyor belt, dipped in hot oil, drained and placed in a holding receptacle. This is particularly useful for high volume operations.

Pressure Fryers.

These fryers come equipped with lids which trap moisture, building up pressure in the cooking chamber. This prevents moisture from leaving the product while keeping the exterior crisp.

Fryers are designed to work best with clean, fresh oil. It is not economical to change oil on a daily basis, consequently steps need to be taken to maximize the life of the fat. Fat breaks down due to exposure to oxygen, heat, food particles, water, and seasonings. Minimizing these factors can result in substantial savings. A good filtration system is also important as it cuts down on human contact with hot oils and surfaces. It is particularly important that employees have proper training before using any type of fryer.

There is one type of cooking equipment that does not fit neatly into any category: Tilting Skillet (Braiser). The tilting skillet can handle any number of tasks. It can be used as a steamer, poacher, deep-fat fryer, kettle, griddle, or holding oven. It is basically a griddle with sides mounted on a pivot. Heat is supplied from beneath the skillet by gas or electricity.

Microwave Ovens. Microwave ovens cook by utilizing a different wavelength of radiation than infrared cooking devices. This radiation causes water to increase in temperature, but not air. The radiation acts on the

liquid present in food, causing the water molecules to vibrate and release energy, raising the temperature enough to cause cooking. Microwave radiation is effective up to a depth of several inches, whereas infrared radiation stops at the surface. Consequently, microwave cooking is faster and more energy efficient. Microwaves need to be improved to handle high volume institutional feeding.

## Holding

The objective of holding is to minimize the likelinood of product deterioration by storing food at a proper temperature for a proper amount of time. There are many types of equipment available.

Infrared Lamp. For plated food to be held for a short time (several minutes at most).

Steam Table. The steam table consists of a water tight bin with gas burners or steam lines running beneath. This type of moist heat holding is very effective. There is little danger of burning food and it is not difficult to hold food at the proper temperature.

Movable Warming Cabinet. These units are heated electronically, thermostatically controlled, and are on wheels so they can be used anywhere. "Hot boxes" vary in size, the largest holding a substantial amount of food. The size and mobility of this piece of equipment make it useful for a high volume institutional feeder.

## Cleanup

The final stage in production is cleaning of production area and equipment. Cleaning is an ongoing activity in which all production personnel should be involved. Putting as much equipment on wheels as possible allows for more extensive cleaning. Equipment can be moved and steam-powered equipment or high-pressure washers used to thoroughly, efficiently clean and sanitize a kitchen. A power washer consists of an electric or gas-powered motor that pumps a combination of hot water and chemicals through a hose at high pressure. This cleaning action washes away dirt and grease, rinses and applies a sanitizing agent.

A properly designed floor allows for drainage. If this is not the case, then a high-powered vacuum capable of picking up water may be needed. Wall mounted hoses, strategically located near frequently cleaned equipment such as steam kettles, makes the cleaning process less complex as well. Cleaning and sanitizing require considerable manpower. A well-run food service operation makes cleanup procedures efficient.

# APPENDIX B.

## The Role of Convenience Foods

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Driven by technological advances and the high cost of labor, convenience foods have played an increasingly larger role in today's food service operations. The impact of these advances is most apparent in the area of food preparation. Since food preparation jobs are traditionally the most simplistic in food service, it is logical that many of these tasks have been the target of automation. The simplicity of these tasks has made it economically feasible for large food processing companies to perform many of the roles previously done by each individual food service establishment.

Convenience foods come in a variety of preparations and packages. The oldest method of food processing is canning. Canned goods are usually fully prepared, ready-to-eat products. Freezing has also become an increasingly popular way of processing high quality products. It is used for raw, semicooked, and fully cooked products. The products undergo thawing and reheating prior to service. Unlike canned products, frozen goods require careful handling. Maintenance of storage temperatures is crucial to maintaining quality, as is the thawing process. The shelf life of frozen foods is not indefinite, and products need to be rotated on a first-in, first-out inventory system.

There has been much debate over the quality of foods which have undergone freezing. Some foods tend to freeze better than others and many products are victims of mishandling in the storage and transportation stages. In other cases, frozen products are fresher than their unprocessed counterparts, as they are often picked, processed, and packaged at their peak. By the time a fresh product reaches a food service establishment, these peaks may have passed. This may be more true for the handling of seafood than any other type of food, due to its perishability. A variety of freezing and packaging techniques are utilized, depending on the product and new technologies are being continually introduced. If a heavy commitment to use of frozen foods is contemplated, the food service establishment must plan for it.

Dried foods have been present in kitchens for many years but are limited in their application. This technique has been used predominantly for storage of beans and grains. Storage requirements consist of a dry space and shelf life is indefinite. A more expensive drying technique involves dehydrating food. This process has been used mostly for potatoes and onions. Freeze-drying is another method frequently used. The product is frozen and then dried in a vacuum, removing all water. Commonly seen applications of this approach include soups and coffee.

New types of convenience foods are being developed. Irradiation of food involves exposure of the product to a low level of radiation that kills off harmful bacteria and slows down the ripening process, resulting in a product which can be stored for long periods of time without refrigeration. A similar process uses pulsed electricity to kill bacteria and increase shelf life. Advancements in the treatment and packaging of convenience products are geared towards reducing storage costs for the food service establishment.

Convenience foods cost more up front than raw products. Below are listed 10 areas where real costs are incurred:

1. COST OF PRODUCT--raw materials vs. processed product.
2. COST OF LABOR--ordering, receiving, preparation and service.
3. COST OF STORAGE--freezers, refrigerators, and operating energy.
4. COST OF INVENTORY--Cost of tying up capital in inventory.
5. COST OF EQUIPMENT--Cost of preparation equipment.
6. COST OF SPACE--space allocation vs. benefit received.
7. COST OF MANAGEMENT--Amount of management required for systems.
8. COST OF SERVICE--Cost of service equipment and setup.
9. COST OF PROCESSING--Cost of utilities (water, electricity, etc.).
10. COST OF AVAILABILITY--Cost of wasted labor awaiting product.

As can be seen, the use of convenience foods impacts virtually all aspects of an operation. Determination of the amount of convenience foods to be used in an establishment can lead to better allocation of funds and result in a better overall design. Outside of cost considerations, nutritional value, taste and texture, and appearance must be compared.